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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/662,004

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Kazuichiro Itonaga

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12/29/2003

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EXAMINER

BREWSTER, WILLIAM M

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 12/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/662,004

Applicant(s)

ITONAGA ET AL.

Examiner

William M. Brewster

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-32 is/are pending in the application.
- 4a) Of the above claim(s) 13-31 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-12,31 and 32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4, 9-12, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jucha et al., U.S. Patent No. 4,915,777 in view of Kishimoto et al., U.S. Publication No. 2001/0048980 A1.

Jucha teaches a method of forming an insulating film on a semiconductor layer, comprising the steps of (a) in fig. 9 loading said substrate 48 including said semiconductor layer on a lower electrode in a processing chamber; and (b) generating, within the processing chamber, plasma biased toward said substrate with the processing chamber kept in an atmosphere including oxygen and with the substrate heated to a temperature of up to 300°C,

limitations from claim 4: wherein the step (b) is carried out at a temperature of up to 200° C: 200-500° C, col. 26, lines 20-40,

and subjecting said semiconductor layer to the biased plasma, wherein an exposed portion of the semiconductor layer on the substrate is oxidized by the biased plasma in the step (b);

limitations from claims 9-12: wherein the step (b) is carried out in an atmosphere including nitrogen and oxygen, wherein the step (b) is carried out in an atmosphere including a NO gas, namely, a nitriding oxidation atmosphere, wherein the step (b) is carried out in an atmosphere including oxygen and N₂, namely, a nitriding oxidation atmosphere, wherein the step (b) is carried out in an atmosphere including O₂ but substantially no nitrogen: N₂O or O₂, col. 26, lines 25-28;

Jucha does not specify biasing the lower electrode the substrate rests on, but Kishimoto does. Kishimoto teaches in fig. 1, loading said substrate 1106 including said semiconductor layer on a lower electrode in a processing chamber, limitations from claim 11, wherein the chamber includes the lower electrode serving as an anode, a bias electrode serving as a cathode and opposing the lower electrode, and a high frequency power supply 1109 for applying high frequency power to the lower electrode through a capacitor 1108, the substrate is placed on the lower electrode in the step (a), and the biased plasma is generated by applying the high frequency power to the lower electrode in the step (b), p. 5 , ¶¶ 67-70,

limitations from claim 2, inherently adjusting a degree of biasing the plasma, will adjust the thickness of said insulating film.

Kishimoto gives motivation on p. 6, ¶¶ 77. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Kishimoto's process with Jucha's invention would have been beneficial because it improves the step coverage of the dielectric.

Claims 5, 7, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jucha in view of Kishimoto as applied to claims 1, 2, 4, 9-12, 32 above, and further in view of Haken U.S. Patent No. 4,442,591.

Jucha and Kishimoto do not specify forming a photoresist on the substrate, but Haken does. Haken teaches a method of forming an insulating film for a semiconductor device for forming, on a semiconductor layer exposed on a substrate, said insulating film through a reaction between at least oxygen and a semiconductor, comprising the steps of: in fig. 1, wherein the step of implanting is carried out with a photoresist film TANK PHOTORESIST formed on said substrate, a step of forming a first active region doped with an impurity of a first conductivity type P TANK IMPLANT, in fig. 3, and a second active region doped with an impurity of a second conductivity type N-TANK, in fig. 4, wherein a first insulating film and a second insulating film 700 Å, are respectively formed on said first active region and said second active region, wherein said insulating film is a gate insulating film of a MIS transistor, col. 8, line 31 - col. 9, line 12, further comprising, after the step (b), a step of conducting a heat treatment on said insulating film, col. 11, lines 46 - 55. Haken gives motivation in col. 1, lines 6-12. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Haken's process with Jucha's and Kishimoto's invention would have been beneficial because it produces the transistors with low mask counts.

Claims 6 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jucha in view of Kishimoto as applied to claims 1, 2, 4, 9-12, 32 above, and further in view of Ju U.S. Patent No. 5,943,565.

Jucha and Kishimoto do not specify forming a gate dielectric with plasma, but Ju does. Ju specifies forming an insulating film is a gate insulating film of oxide of a MIS transistor and gives motivation in col. 4, lines 28-44. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Ju's process with Jucha's and Kishimoto's invention would have been beneficial because it minimizes transient enhanced diffusion.

Response to Arguments

Applicant's arguments with respect to all claims have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William M. Brewster whose telephone number is 703-305-5906. The examiner can normally be reached on Full Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-305-3432.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

William M. Brewster